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National Income Estimation by Means of Monetary Variables, the Case of Spain, 1772–1972. Some Preliminary Results

The reason why we are trying to carry out this kind of exercise is the same which has induced other researchers[1] to attempt it for other countries, namely the lack of satisfactory sources for national income estimates. It is expected, however, that in the not too distant future our research on Spanish output and productivity in the nineteenth and twentieth centuries will have yielded, among other things, more direct and reliable national income estimates for the nineteenth century, and at least some refinements upon those series now extant of Spanish national income in the twentieth century. This could seem to make the present project redundant. In our view, however, the project offers a series of advantages which make it worthwhile. In the first place, it will provide us with a first estimate in a relatively short time; this preliminary estimate should serve to orient us in research and as a possible test of some of our other estimates. Furthermore, the relative abundance of data for the twentieth century will permit us to contrast the method, as we will presently see, and possibly to discriminate between the several extant estimates. Finally, the result of our work will be a test of the method itself, and could suggest new ideas for further research.

The method of estimation is conceptually simple. Starting from the well known Fisher identity, we solve for PT ($\equiv$ Y $\equiv$ Gross National Product). Our basic equation would be

$$Y = MV, \tag{1}$$

where M = Money supply, and V = Income velocity. By using the equation in this form we are trying to take advantage of two facts: one, that we have a continuous series of money supply from 1874 (plus some spot estimates for earlier years); and two, that a considerable body of literature, plus our own calculations with the available data on money and income suggest a remarkable stability of V.[2]

1. Hawke, G. R., *Income Estimation from Monetary Data: Further Explorations*, in: Review of Income and Wealth, 21 (1975), no. 3; Leff, Nathaniel, *A Technique for Estimating Income Trends from Currency Data and an Application to Nineteenth-Century Brazil*, in: Review of Income and Wealth, 18 (1972), no. 4.
2. For a brief and incomplete survey of the literature on this topic see Tortella, Gabriel, *Estimación de la Renta Nacional española a partir de datos monetarios. Consideraciones preliminares (1789–1956)*, Typescript April 1981.

Table 1: Money, Income, and Income Velocity, 1865–1972

	(1) Money Supply[a]	(2) National Income[a]	(3) Income Velocity
1865	1 51o	5 o46	3.3414
1879	1 792	5 21o	2.9o74
1882	1 968	5 992	3.o447
1888	2 199	6 7o8	3.o5o5
1894	1 994	6 669	3.3445
19o1	3 229	1o 152	3.144o
19o2	3 o63	1o 4o9	3.3983
19o3	3 141	1o 75o	3.4225
19o4	3 o74	11 125	3.6191
19o5	2 945	11 2o1	3.8o34
19o6	2 884	11 324	3.9265
19o7	2 875	11 672	4.o598
19o8	2 785	11 926	4.2822
19o9	2 9o4	12 381	4.229o
191o	2 926	12 o38	4.1141
1911	2 973	12 745	4.2869
1912	3 129	12 638	4.o39o
1913	3 2o8	13 o86	4.o792
1914	3 32o	14 382	4.3319
1915	3 849	16 4o7	4.2627
1916	4 345	2o o47	4.6138
1917	5 37o	25 471	4.7432
1918	6 856	29 323	4.277o
1919	7 742	33 855	4.3729
192o	8 727	32 863	3.7657
1921	8 579	26 925	3.1385
1922	8 414	25 66o	3.o497
1923	8 49o	26 916	3.1731
1924	8 927	28 927	3.24o4
1925	9 o1o	31 35o	3.4795
1926	8 8o2	31 1o2	3.5335
1927	9 327	31 244	3.3498
1928	9 652	31 oo2	3.212o
1929	9 839	31 844	3.2365

Table 1 (Fortsetzung)

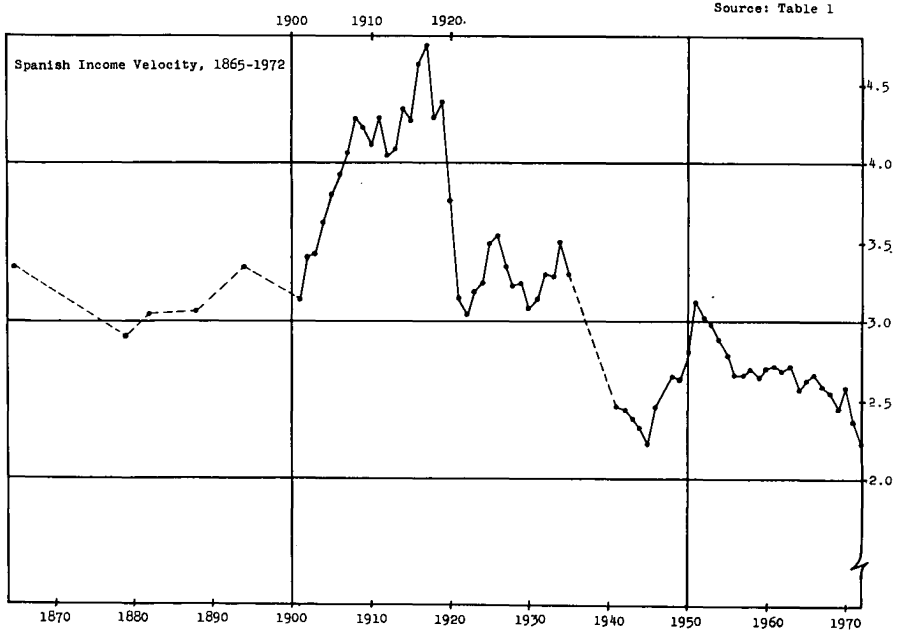
	(1)	(2)	(3)
193o	1o 226	31 5o3	3.o8o7
1931	1o 156	31 922	3.1432
1932	9 986	32 921	3.2967
1933	9 863	32 324	3.2773
1934	9 946	34 892	3.5o81
1935	1o 4oo	34 358	3.3o37
1941	22 98o	56 562	2.4614
1942	26 786	65 535	2.4466
1943	28 776	68 771	2.3899
1944	32 352	74 788	2.3117
1945	36 o72	79 737	2.21o5
1946	45 191	11o 9o8	2.4542
1947	51 67o	132 675	2.5677
1948	53 259	141 o52	2.6484
1949	57 798	151 42o	2.6198
195o	66 o44	182 o36	2.7563
1951	77 535	241 174	3.11o1
1952	85 277	256 7o2	3.o1o2
1953	91 691	272 635	2.9734
1954	1o2 514	294 816	2.8759
1955	117 695	327 693	2.7843
1956	141 212	376 746	2.6679
1957	164 758	439 516	2.6676
1958	187 719	5o8 456	2.7o86
1959	198 883	523 o67	2.63oo
196o	197 829	532 7o1	2.6927
1961	223 916	6o9 5o6	2.722o
1962	265 367	7o9 623	2.6741
1963	31o 416	841 29o	2.71o2
1964	368 55o	946 228	2.5674
1965	426 557	1 117 82o	2.62o6
1966	477 971	1 274 6o1	2.6667
1967	543 o39	1 4oo 759	2.5795
1968	6o9 378	1 552 134	2.5471
1969	698 765	1 7o7 747	2.444o

Table 1 (Fortsetzung)

	(1)	(2)	(3)
1970	739 994	1 907 506	2.5777
1971	915 144	2 160 481	2.3608
1972	1 132 668	2 520 537	2.2253

a Millions of current pesetas

Sources: Money: 1865, Tortella Casares, Gabriel, La economía española, 1830-1900, in: Tortella Casares, Gabriel, et al. (eds.), Revolución burguesa, oligarquía y constitucionalismo (1834-1923), Barcelona 1981, p. 124. For the rest of the series, Bustelo, and Tortella, Monetary Inflation, Table I.
Income: 1865-1894, Prados de la Escosura, Análisis, pp. 165-168, 211-212, esp. Table E-2. (The figure for 1865 has been interpolated linearly). 1901-1972, Alcaide, Revisión, pp. 1138 f.



A continuous money supply series from 1874 to 1972 has been published by Bustelo and Tortella.[3] This series comes from a variety of sources and can undoubtedly be improved. The 1918–1935 segment has been corrected by Pablo Martín Aceña in his yet unfinished doctoral dissertation, and the 1940–1954 segment should also be revised. In this paper we have been unable to incorporate these improvements; this is one of the factors which make it provisional. Though unrefined, however, the series is adequate for our present purposes.

Coupling the Bustelo-Tortella monetary series with the available national income estimates we obtain the first historical series for Spanish income velocity hitherto published (Table 1).

This velocity series elicits a few comments. In the first place, its stability is remarkable. Over more than a century its range has lain between 4.74 (1917) and 2.21 (1945). In fact, this stability is surprising in view of, among other things, the downward trends displayed in the Doblin[4] and other series. The Spanish series also exhibits a downward trend in the long run; but it is a very slow trend, and with a strong reversal in the years 1901–1917.

In the second place, however, the shorter-term fluctuations can be explained by taking account of the peculiarities of Spanish monetary and economic history. Restrictive monetary policies and the loss of gold in the last quarter of the nineteenth century checked the growth of M and kept V fairly stable. The fall between 1894 and 1901 was due to the rapid expansion of paper money which accompanied the War of Cuban Independence. The war was followed by a very strict stabilization plan which restricted budget expenditures and banknote circulation. This explains the constant growth of V until 1908, when restrictive policies were eased. The next spurt of growth in V took place during the First World War and was due to real rather than monetary causes. Spain remained neutral during the war, and had an export boom which provoked scarcities and steep price rises: prices running ahead of money brought about increases in V. The reverse process took place in the following years: prices declined faster than money and V dropped drastically between 1918 and 1922; it hovered at around its 'normal' level (3.00–3.50) until the Spanish Civil War. The trough reached by V during the mid-1940's was probably due to the low levels of income which characterized the first years of the Franco era, and the increase in 1946–51 to the gradual economic recovery towards prewar economic levels. The relatively mild decline which ensued must be attributed to the 'normal' decrease in V which is typical of the early and middle stages of growth.[5]

In the third place, the relative stability of V over the long run, and the relative ease with which we can explain shorter-run fluctuations are encoraging signs that the series are reliable. This is especially good news with respect to the nineteenth-century income figures, which are based upon Mulhall's estimates. The provisional accepta-

3. Bustelo, Francisco, and Tortella, Gabriel, *Monetary Inflation in Spain 1800–1970*, in: Journal of European Economic History, 5 (1976), no. 1.
4. Doblin, Ernest, *The Ratio of Income to Money Supply: An Inter-National Survey*, in: Review of Economics and Statistics, 33 (1951), no. 1.
5. Anderson, Paul S., *Behavior of Monetary Velocity*, in: New England Economic Review (Federal Reserve Bank of Boston), March-April 1977.

bility of the Mulhall-Prados[6] income figures is buttressed by a series of circumstantial facts: first, they seem to tally well with the monetary series; second, they show continuity with the Alcaide[7] income series starting in 1901; and third, Mulhall's figures for other countries have been vindicated by later research.

In the fourth place, while these figures and conclusions augur well for our ability to reach our ends for the period from 1865, that from the end of the eighteenth century to 1865 appears more problematic. It is very unlikely that we may obtain a yearly series of money supply for that time span. Even decennial figures appear highly improbable. The best we could realistically hope for would be a few scattered estimates permitting reasonable interpolations. This attained, we could make some simple assumptions about velocity. One of these assumptions, probably the best, would be a linear or exponential extrapolation of the trend in our 1865–1972 series. Other possible assumptions could be a fixed V with maximum and minimum intervals or bands, and the adoption of known velocities for other countries in comparable growth stages.

If not even this spotty series were available, then a second (or third) best solution would be just a simple benchmark figure which, in the Friedman-Leff manner, would give us an estimate of the long-term growth rate of income.[8]

For this, from equation (1) we obtain:

$$\dot{y} = \dot{m} + \dot{v}, \tag{2}$$

where lower-case, dotted letters symbolize percentage rates of growth of the higher-case variables.

Our benchmark money figure combined with, say, our 1865 figure, would give us $\dot{m}$, while $\dot{v}$ would be estimated according to the assumptions mentioned previously. In any case, $\dot{v}$ would be either negative or zero, so that

$$\dot{y} \leq \dot{m}.$$

This assumption of a decreasing or, at most, constant V is based upon the experience of many other countries in their early stages of development,[9] and will serve us to discriminate between different possible estimates. For instance, Canga Argüelles's[10] estimate of a gold and silver currency stock for 1772 of 4,886 million reales (accepted by Sardá[11] with little questioning) is a gross overestimate, as our reasoning will show.

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6. Prados de la Escosura, Leandro, *Análisis económico del Comercio Exterior de España en los siglos XVIII y XIX,* Doctoral Thesis, Universidad Complutense de Madrid 1981.
7. Alcaide Inchausti, Julio, *Una revisión urgente de la serie Renta Nacional espanola en el siglo XX,* in: Datos básicos para la Historia Financiera de España (1850–1975), vol. I, Madrid 1976.
8. Friedman, Milton, *Money and Economic Development,* New York 1973; Friedman, Milton, *Monetary Data and National Income Estimates,* in: Economic Development and Cultural Change, (April 1961); Leff, *Technique.*
9. See Doblin, *Ratio;* Anderson, *Behavior;* Leff, *Technique;* Cohen, Jon S., *Italy 1861–1914,* in: Cameron, Rondo (ed.), Banking and Economic Development. Some Lessons of History, New York 1972.
10. Canga Argüelles, José, *Diccionario de Hacienda,* 2 vols., Madrid 1833–34.
11. Sardá, Juan, *La Política Monetaria y las Fluctuaciones de la economía española en el siglo XIX,* Madrid 1948.

A simple interpolation of two estimates of national income by Grupo '75[12] for 1755 and by Arthur Young[13] for 1792 shows that Spanish national income in 1772 was around 3,700 million reales (no space here to give details about the problems involved in these calculations; our reasoning admits very wide margins of error). This would make the money supply larger than national income and, consequently, V less than one (around .75 in fact). Such a small V at such early date is unbelievable. For Canga's figure to be correct while V standing at around 3.5 (a very low bound), national income would have had to be five times larger than our estimate. Among other things, this would imply that income should have grown between 1772 and 1865 at a rate below 0.1 percent and therefore that per capita income should have decreased at a rate of perhaps −0.3 percent between the two dates (this is in current money; the decline would be larger if we allowed for inflation). Such long-term depression is clearly out of the question: Canga's estimate should be rejected in spite of his being a respected source of macroeconomic information from his writing days in the early nineteenth century (I am leaving aside here his highly questionable estimation procedure).

To sum up, our method seems fruitful for our research, both as a way to check the trustworthiness of existing income and/or money estimates, and to extrapolate and interpolate a series. The problems, naturally, are less tractable for the first part of our period.

Zusammenfassung: Die Schätzung des Volkseinkommens anhand monetärer Variablen am Beispiel Spaniens, 1772–1972

Hiermit werden einige Aspekte des Forschungsprojektes über "Einkommen, Output und Produktivität in Spanien vom achtzehnten Jahrhundert bis in die Gegenwart" vorgestellt. Eine Gruppe von Wirtschaftshistorikern arbeitet an diesem Projekt, das von der spanischen Zentralbank gefördert wird.

In diesem Beitrag wird versucht, die möglichen wie auch die bereits erreichten Resultate darzulegen, die bei der Aufstellung einer Zeitreihe über das spanische Volkseinkommen auf der Grundlage von monetären Variablen zu erzielen sind. Monetäre Angaben sind recht leicht zusammenzustellen und liegen jährlich bereits seit 1874 vor.

Milton Friedman hat dieses Schätzverfahren erstmals angewandt. Es geht von der grundlegenden Voraussetzung aus, daß die Geldumlaufgeschwindigkeit (der Koeffizient von Volkseinkommen zu Geldmenge) eine ziemlich stabile Größe ist. Und tatsächlich wird diese Annahme durch empirische Angaben aus einer Vielzahl von Län-

12. Grupo '75, *La economía del Antiguo Régimen. La "Renta Nacional" de la Corona de Castilla*, Universidad Autónoma de Madrid, Departamento de Historia Contemporánea, Madrid 1977.
13. Young, Arthur, *Travels during the years 1787, 1788 and 1789 in France for which is Added the Register of a Tour into Spain*, Dublin 1793 (cited in Prados de la Escosura, *Análisis*, *p.* 91).

dern bestätigt: Bei nur geringen Abweichungen von Jahr zu Jahr weist die Umlaufgeschwindigkeit eine langfristige Tendenz zur Verlangsamung auf. In weit fortgeschrittenen Volkswirtschaften kehrt sich dieser Trend jedoch um, d.h., die Umlaufgeschwindigkeit hat die Tendenz, sich zu erhöhen, und auch dieses nur mit geringen Schwankungen.

Die Umlaufgeschwindigkeit in Spanien scheint sich in dieses Muster einzufügen. Unsere Zahlen belegen, daß die Umlaufgeschwindigkeit hier einen Trend zur Verminderung aufweist. In den Zeitspannen von 1901 bis 1908, von 1914 bis 1917 und von 1946 bis 1951 jedoch kehrte sich als Folge von Kriegseinflüssen dieser allgemeine Trend um: Der kubanische Unabhängigkeitskrieg, der Erste Weltkrieg sowie der spanische Bürgerkrieg waren für diese Trendumschwünge verantwortlich.

Doch sieht man von diesen Störungen einmal ab, so erweist die relative Stabilität der Umlaufgeschwindigkeit, daß die vorgesehene Schätzmethode durchaus anwendbar ist. Am Ende des Artikels werden einige Probleme umrissen, die dabei auftauchen, wenn man die Methode auf das frühe neunzehnte Jahrhundert anwenden will; denn für diesen Zeitraum sind Schätzungen der Geldmenge nur schwer zu erstellen.